

King County's Approach to Shoreline Inventory and Characterization

Harry Reinert

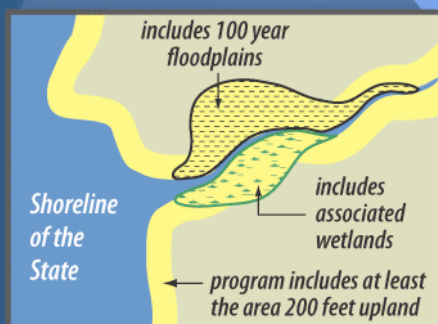
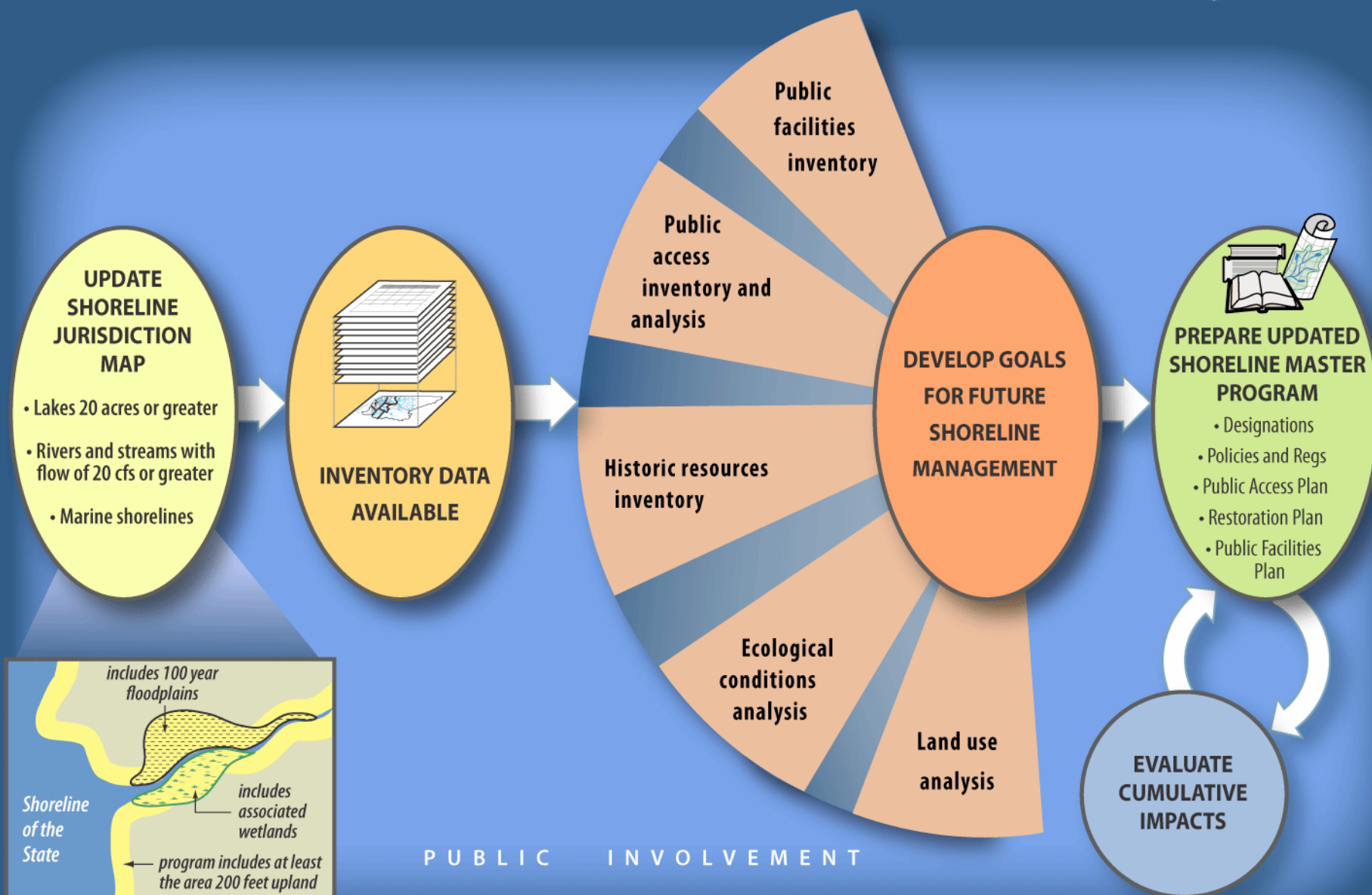
Dept. of Development and Environmental Services

Kollin Higgins

Dept. of Natural Resources and Parks

Overview and Timeline

- 2005-2007 Ecology Grant
- Inventory and characterization 2006-early 2007
- Peer review in September 2006, January 2007
- Public involvement in winter/spring 2007
- Draft Program in summer 2007
- Ongoing intergovernmental coordination



 King County Shoreline Areas Analyzed for the Shoreline Master Program

PUBLIC INVOLVEMENT

Public Access Inventory

1. Develop criteria to define public access sites
2. Compile geographic public access data that intersects shoreline area:
 - Public parks (federal, state, county) – showing facilities such as boat launches
 - Public trails
 - Natural resource lands (county-owned)
 - Private properties with public access agreements (current use tax program)
 - Informal access points on public lands

Public Access Analysis

1. Identify gaps in public access:

- Trust for Public Lands “GreenPrint” analysis (identifies high priority links between existing parks and trails)
- Visual analysis
- Professional judgment (natural lands and park managers and staff)

2. Identify opportunities for new access points, such as public street-ends or ROW in shoreline area

Historic Resources Inventory

- Map landmarks in shoreline areas
- Describe prehistoric and historic resources by shoreline reach and watershed



Land Use Analysis

- Identify commercial and industrial zones and Comprehensive Plan designations in shoreline areas
- Map parcels with existing commercial uses in shoreline areas
- Categorize type of commercial use as water-dependent, -related or –enjoyment (likely via aerial photo analysis)
- Evaluate relationship of existing water-oriented uses to shoreline designations

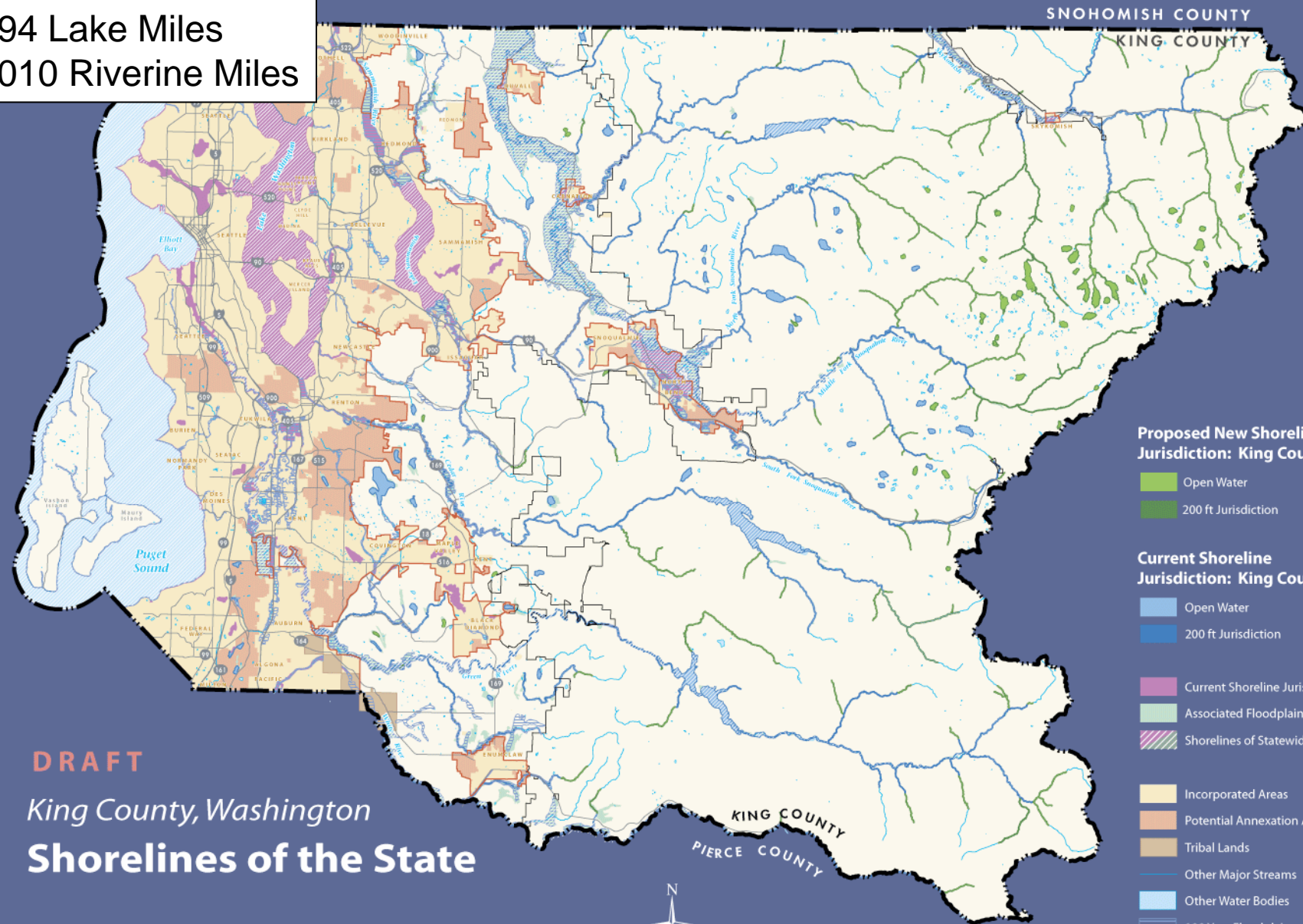
Public Facilities Inventory

- Map public facilities in shoreline area:
 - Transportation
 - Stormwater
 - Wastewater
 - Flood management
- Review existing facilities plans
- Evaluate relationship to existing shoreline designations

Shoreline Characterization

- Inventory of shoreline conditions
- Identify ecosystem-wide processes and functions
- Assess ecosystem-wide processes
 - Which ecological functions are present
 - Status - healthy, significantly altered, or previously existing but now missing

51 Marine Miles
294 Lake Miles
1010 Riverine Miles



Proposed New Shoreline Jurisdiction: King County

- Open Water
- 200 ft Jurisdiction

Current Shoreline Jurisdiction: King County

- Open Water
- 200 ft Jurisdiction

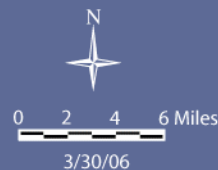
- Current Shoreline Jurisdiction: Inc. Area
- Associated Floodplains and Wetlands
- Shorelines of Statewide Significance

- Incorporated Areas
- Potential Annexation Areas
- Tribal Lands
- Other Major Streams
- Other Water Bodies
- 100 Year Floodplain
- Urban Growth Boundary
- Forest Production District
- King County Boundary

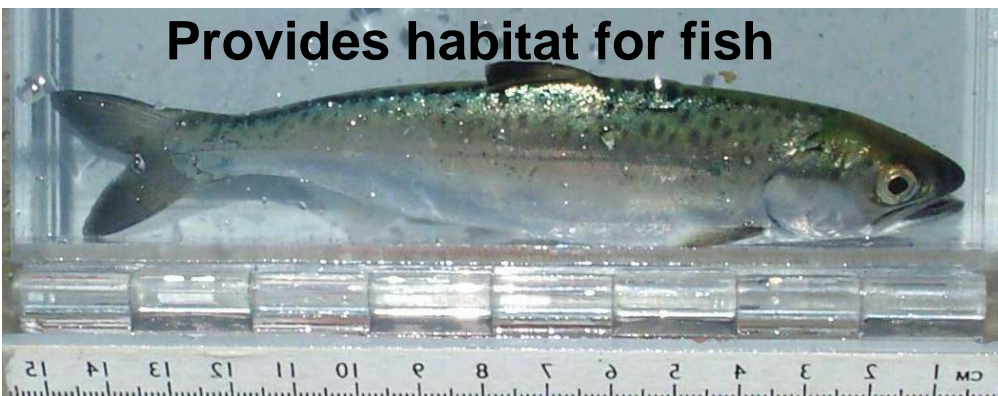
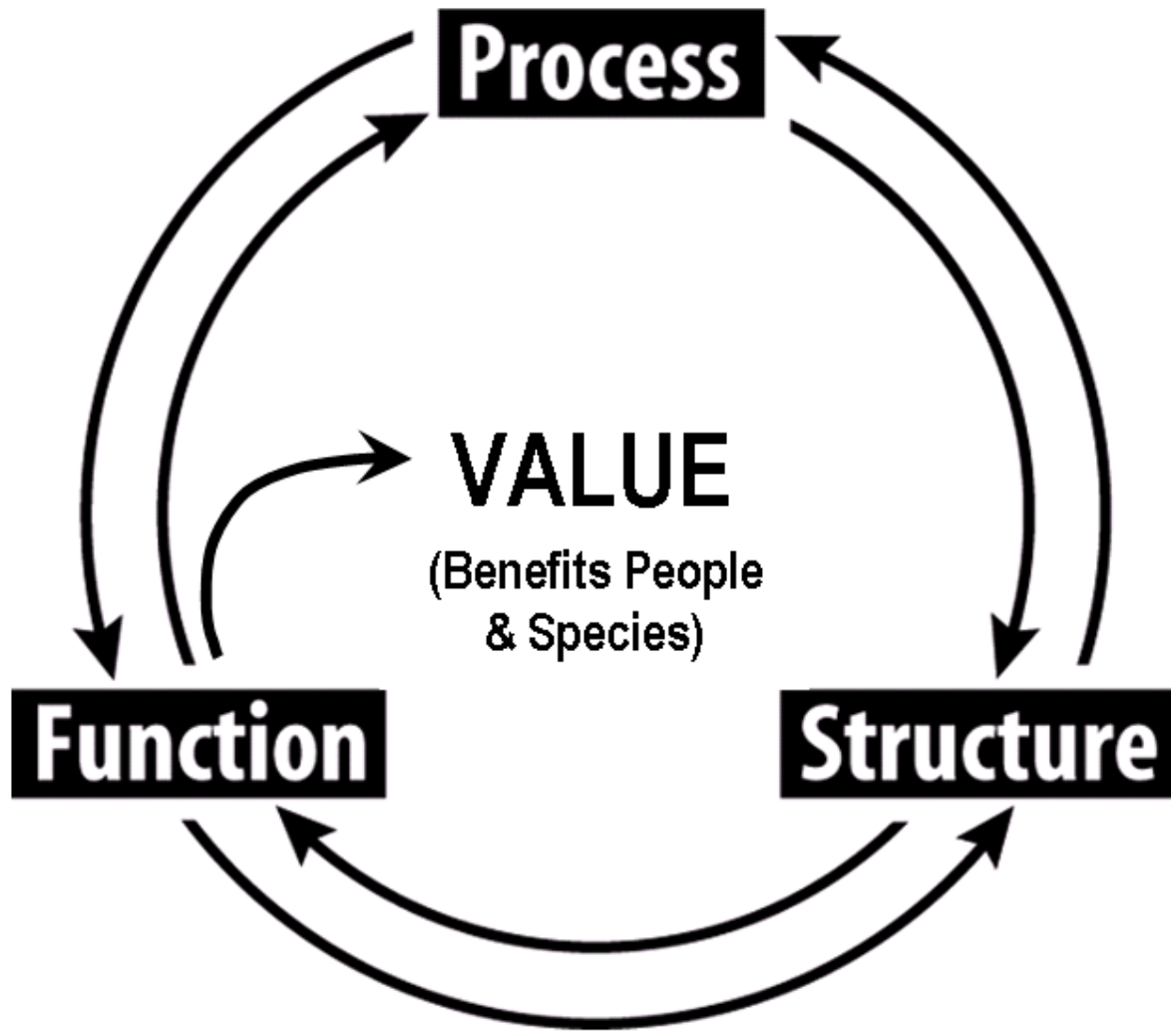
DRAFT

King County, Washington
Shorelines of the State

 **King County**
Department of Natural Resources and Parks
Water and Land Resources Division



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Process Scales

- Regional - at a scale of 100s of miles (e.g., tides, climate, volcanoes)
- Local/landscape - at a scale of one mile or less (e.g., bluff erosion, longshore transport, LWD recruitment)
- Finite - generally at a scale of several yards (e.g., competition, predation, nutrient uptake)

Ecosystem Process

Stanley et al	PSNERP	Battelle
LWD	LWD	
Water	Water	Water
Sediment	Sediment	Sediment
Phosphorous/ Toxins	Phosphorous/ Toxins	Phosphorous/ Toxins
Nitrogen	Nitrogen	Nitrogen
Pathogens		Pathogens
	Tidal Cycle	Tidal Encroachment
	Wave Energy	Wave Energy
	Food Web	
	Ecological	
		Light Energy

KC combined the three studies to for its list of processes

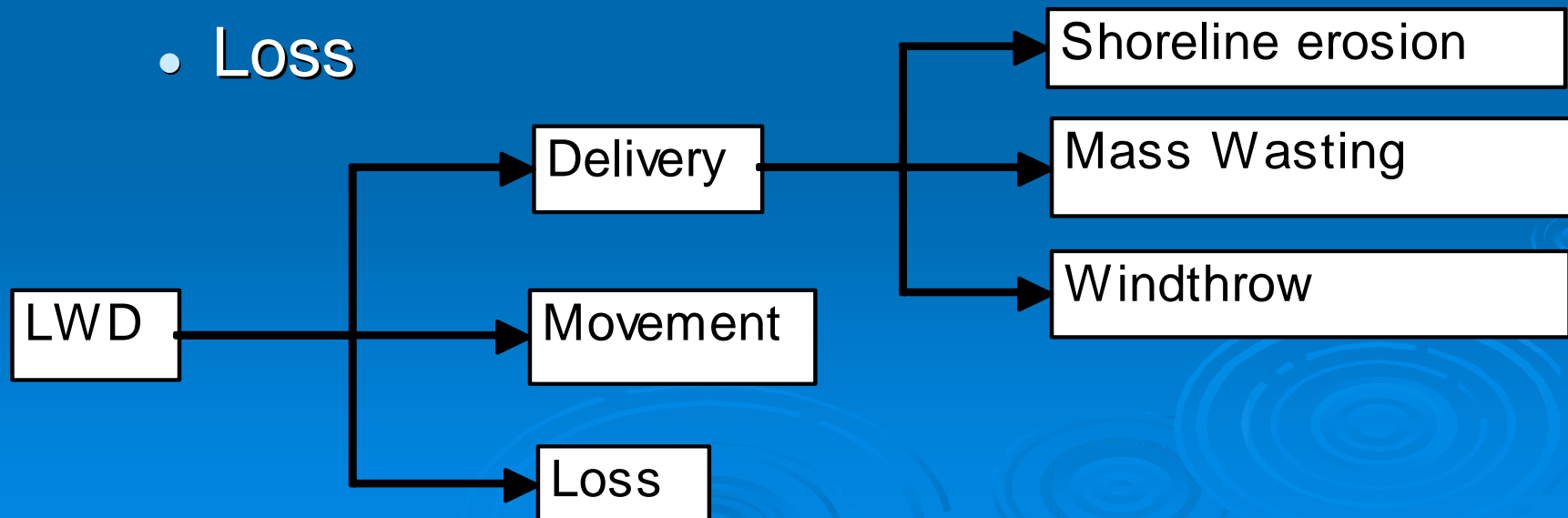
Stanley et al	PSNERP	Battelle	KC
LWD	LWD		LWD
Water	Water	Water	Water
Sediment	Sediment	Sediment	Sediment
Phosphorous/ Toxins	Phosphorous/ Toxins	Phosphorous/ Toxins	Phosphorous
Nitrogen	Nitrogen	Nitrogen	Nitrogen
Pathogens		Pathogens	Pathogens
	Tidal Cycle	Tidal Encroachment	Tidal Cycle
	Wave Energy	Wave Energy	Wave Energy
	Food Web		
	Ecological		
		Light Energy	Light Energy
			Toxins

Biological Processes

- King County will not directly address biological processes
 - Difficult to map predation and competition, etc
 - Known biological presence does not equate to unaltered processes (e.g., no fish presence above natural barriers).
- Ecological functions will be addressed indirectly through this analysis.
- KC will map the known distribution of important biological resources separately.

Relied on Stanley et al. 2005 to describe processes

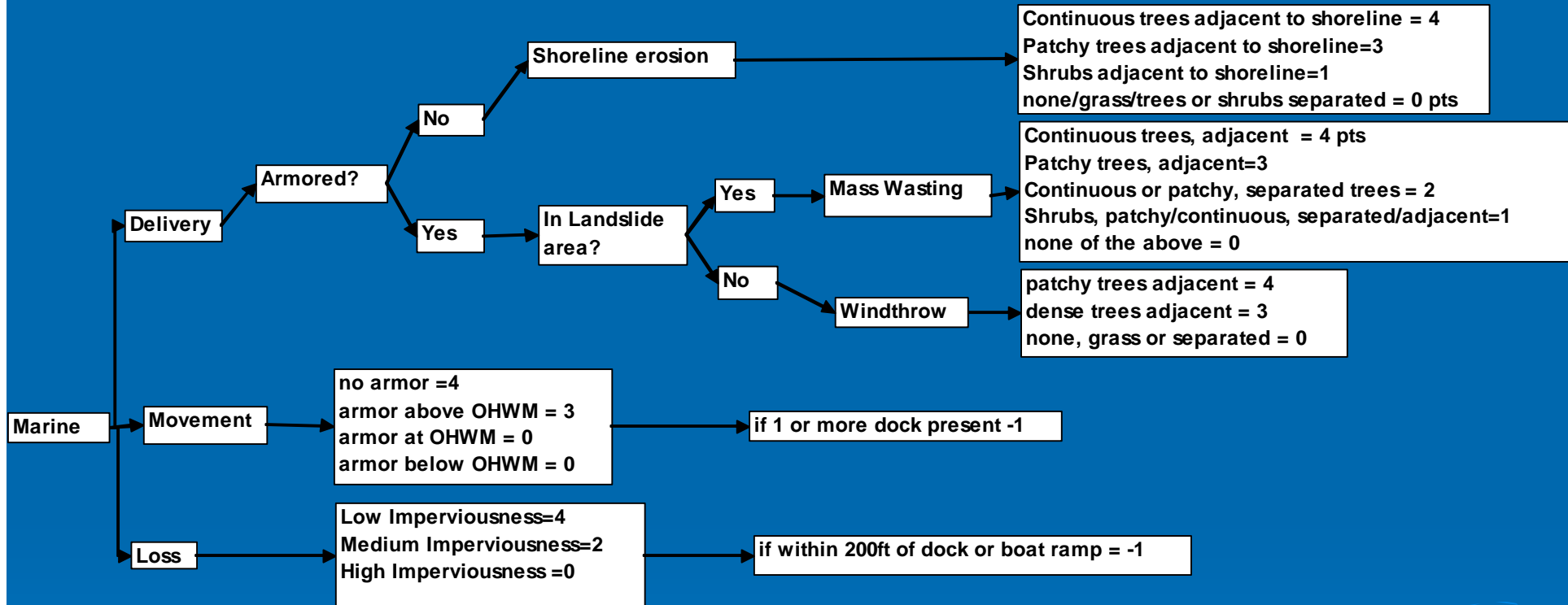
- Processes are broken into 3 portions
 - Delivery
 - Movement
 - Loss
- Each of these can have several components



Analytical Framework

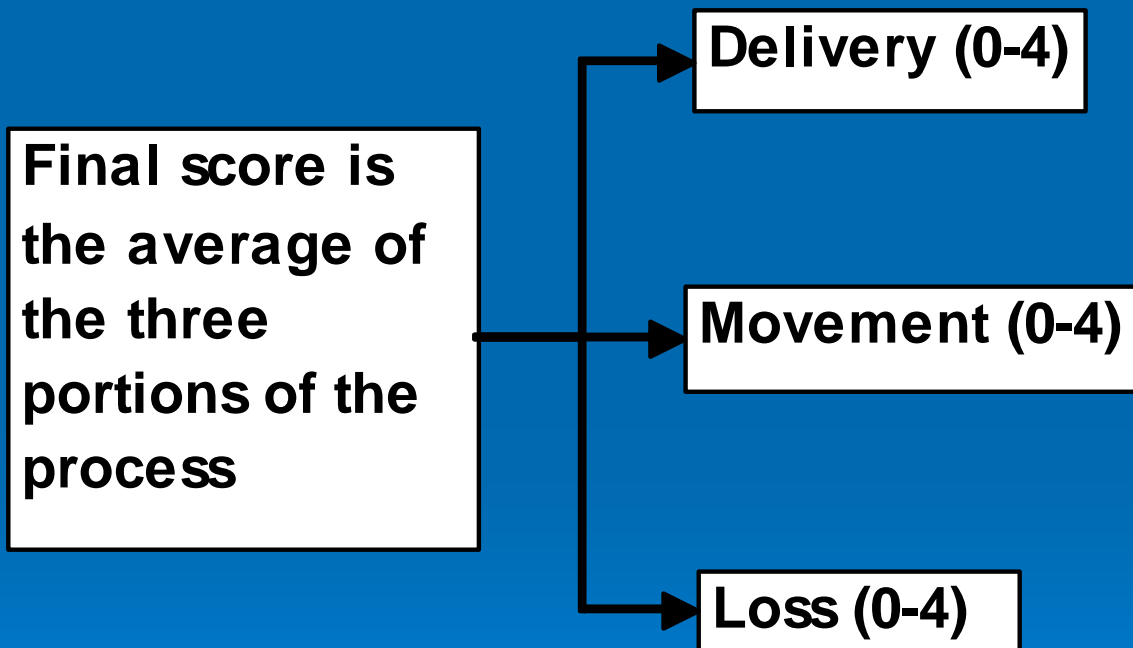
- Using Model Builder in ArcGIS 9
- Spatially explicit raster (grid) model
 - All data (points, polygons, arcs) will be converted into a grid format
- Grid size (or pixel size) will be 25 ft by 25 ft
- Breaking shoreline into 3 types-Marine, Riverine and Lake.
 - 10 processes with 3 shoreline types = 30 models
- Analyzing KC SMA jurisdiction (plus a few other jurisdictions)

Marine LWD Model Example



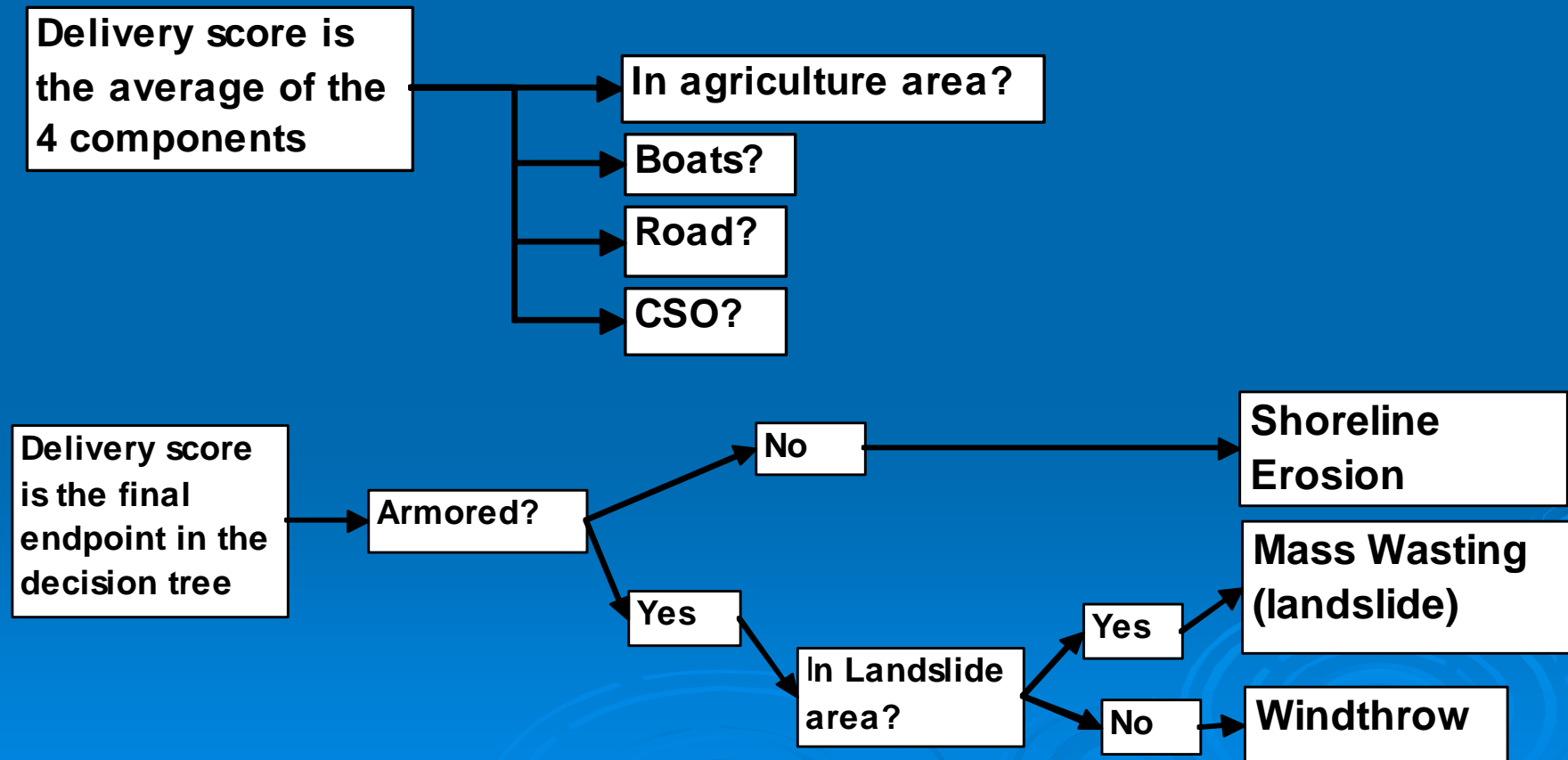
Model Scoring

- Each pixel will be scored 0-4 each for Delivery, Movement, & Loss
- Each model will produce an averaged total score from 0-4 for each pixel
- Some scoring will only occur on the first shoreline pixel (i.e. LWD-loss)

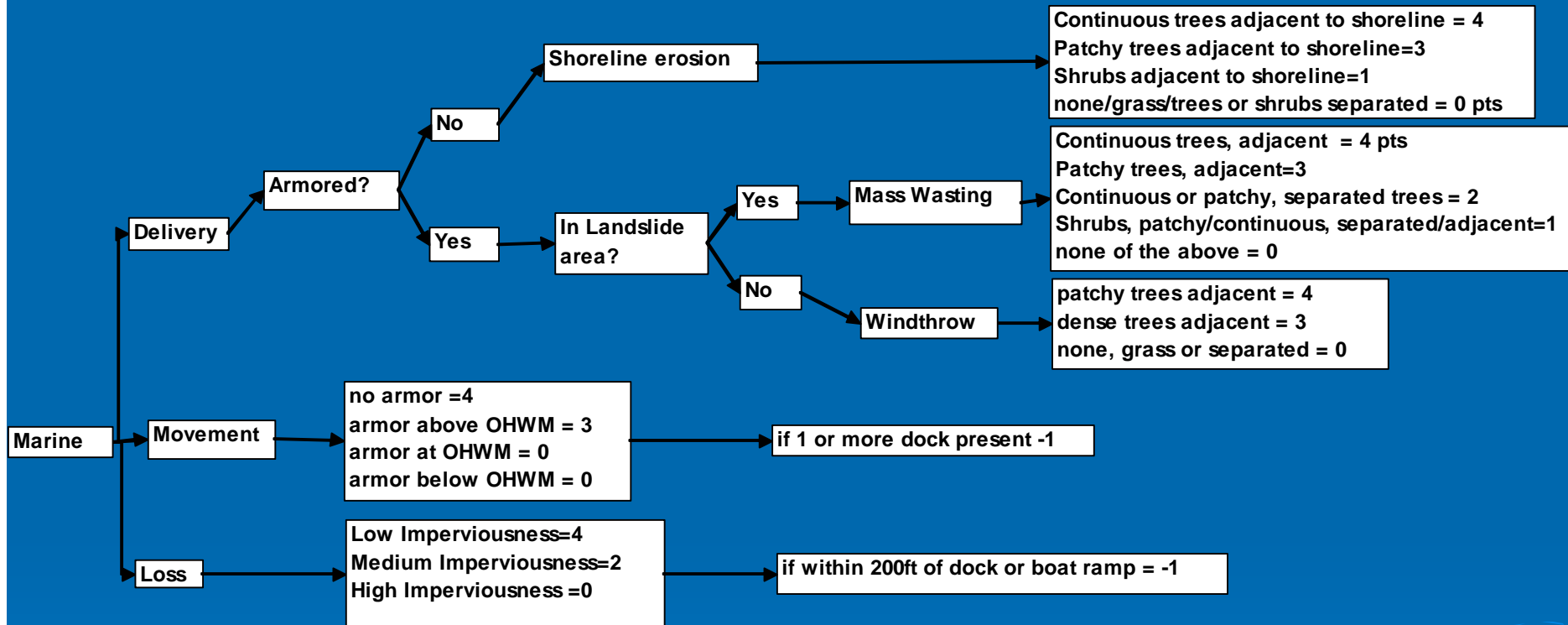


Model Scoring, cont.

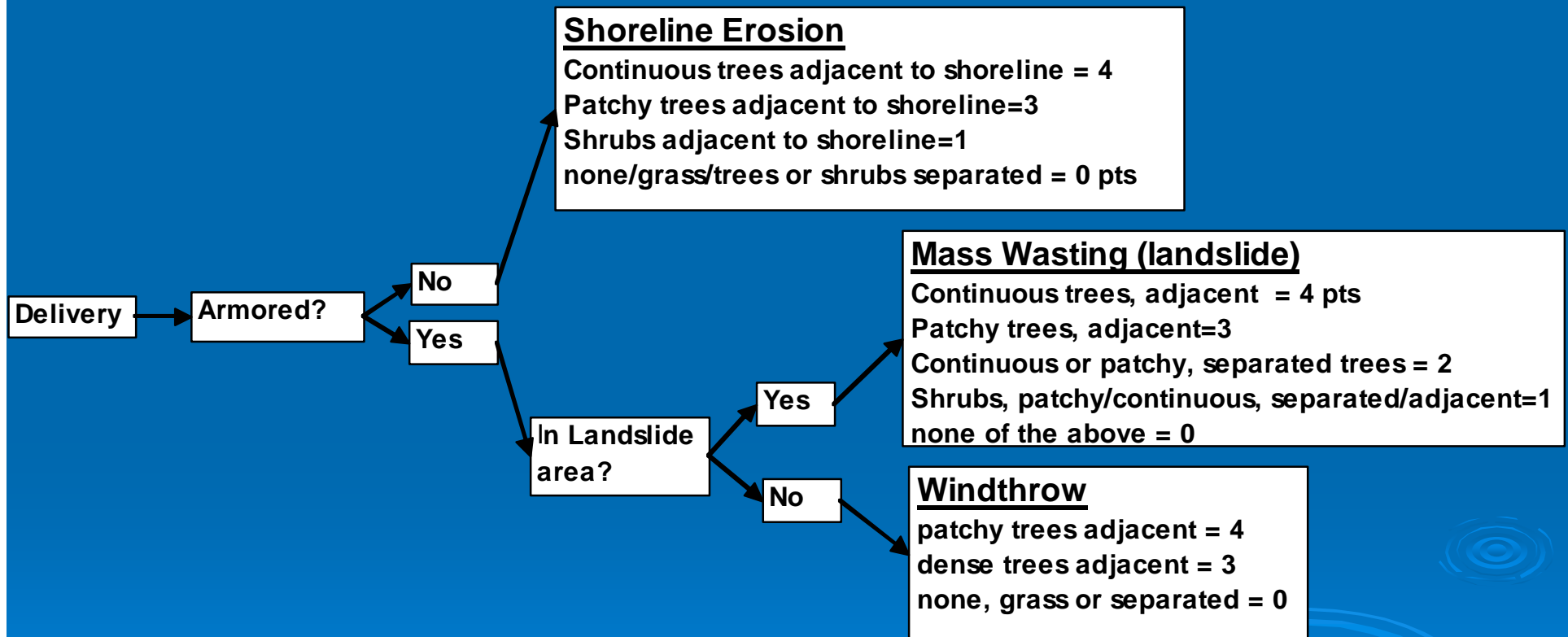
- The component part of the model is scored in one of two ways.



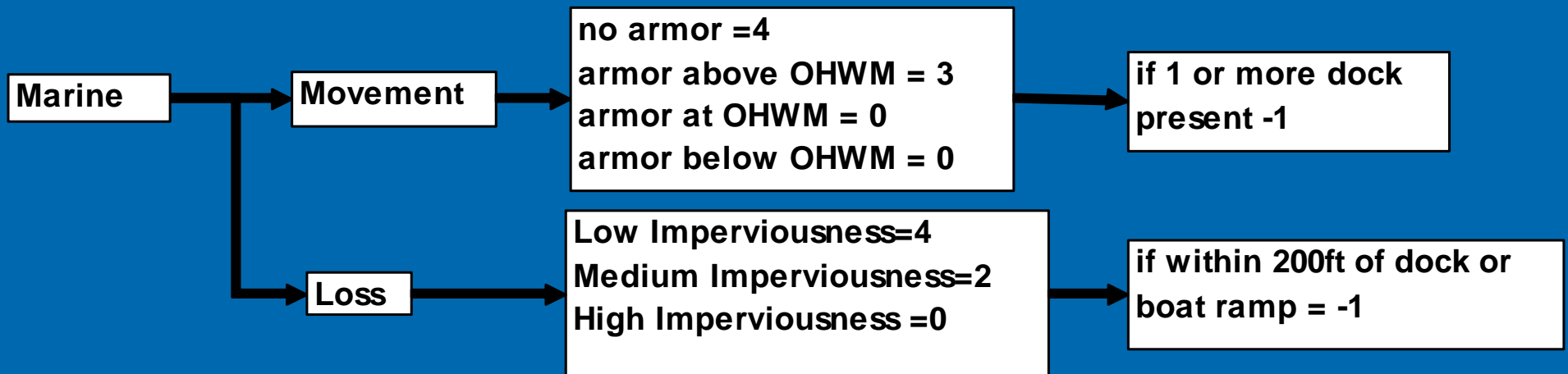
LWD-Marine



Delivery LWD-Marine



Movement & Loss LWD-Marine



Large Woody Debris

Delivery = 2
Movement = 0
Loss = 1

Total Average 1

200 ft.

Delivery

Delivery = 4
Movement = 4
Loss = 4

Total Average 4

Movement Loss

- Armored
- Patchy, separated, not overhanging trees
- No wood accumulations
- Landslide Hazard Area

- Unarmored
- Continuous, adjacent, overhanging trees
- LWD
- Landslide Hazard Area

Total
Average 1

Total
Average 4

Delivery

Movement Loss

- Unarmored
- Continuous, adjacent, overhanging trees
- LWD
- Landslide Hazard Area

Totals

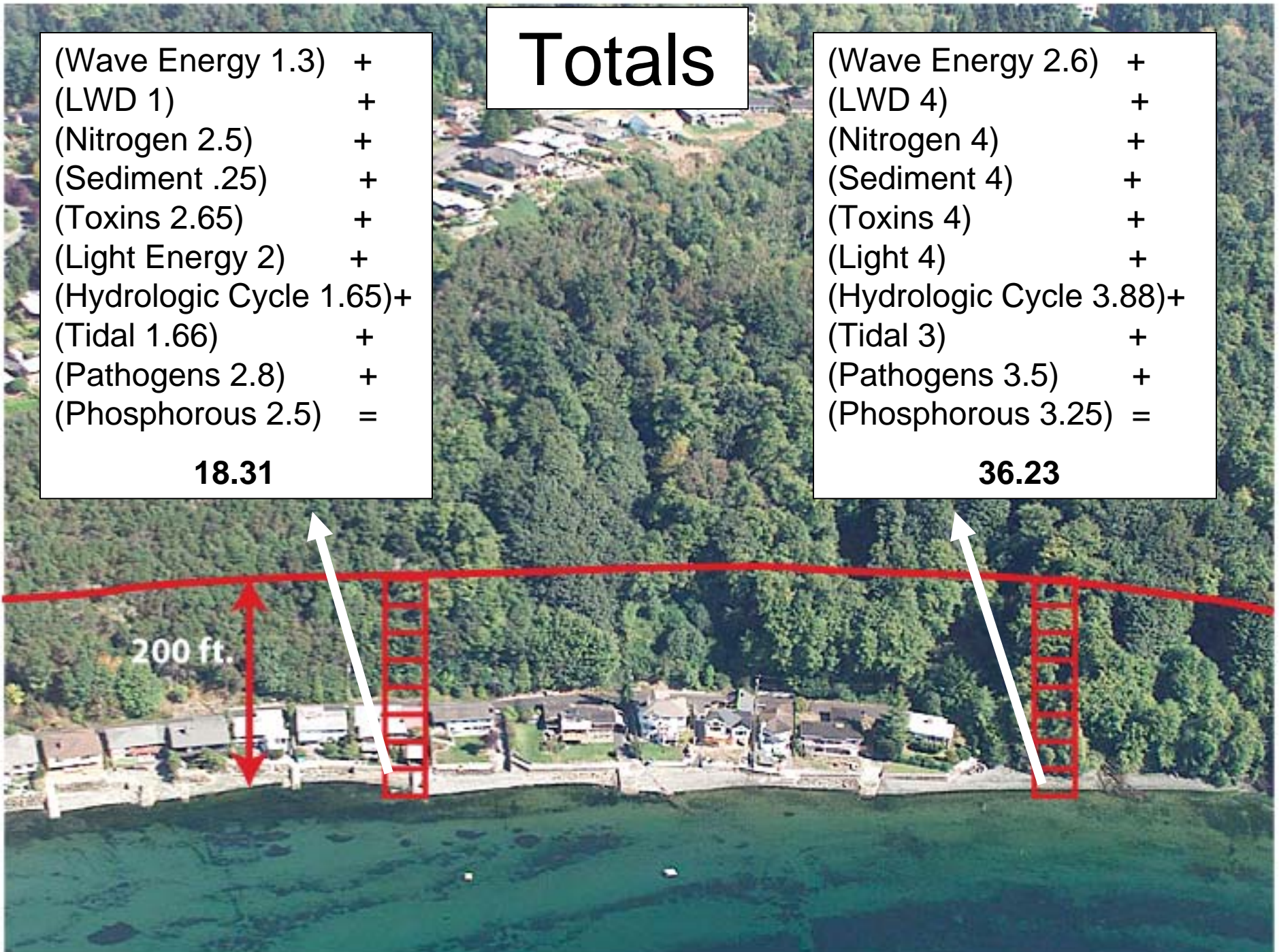
(Wave Energy 1.3) +
(LWD 1) +
(Nitrogen 2.5) +
(Sediment .25) +
(Toxins 2.65) +
(Light Energy 2) +
(Hydrologic Cycle 1.65)+
(Tidal 1.66) +
(Pathogens 2.8) +
(Phosphorous 2.5) =

18.31

(Wave Energy 2.6) +
(LWD 4) +
(Nitrogen 4) +
(Sediment 4) +
(Toxins 4) +
(Light 4) +
(Hydrologic Cycle 3.88)+
(Tidal 3) +
(Pathogens 3.5) +
(Phosphorous 3.25) =

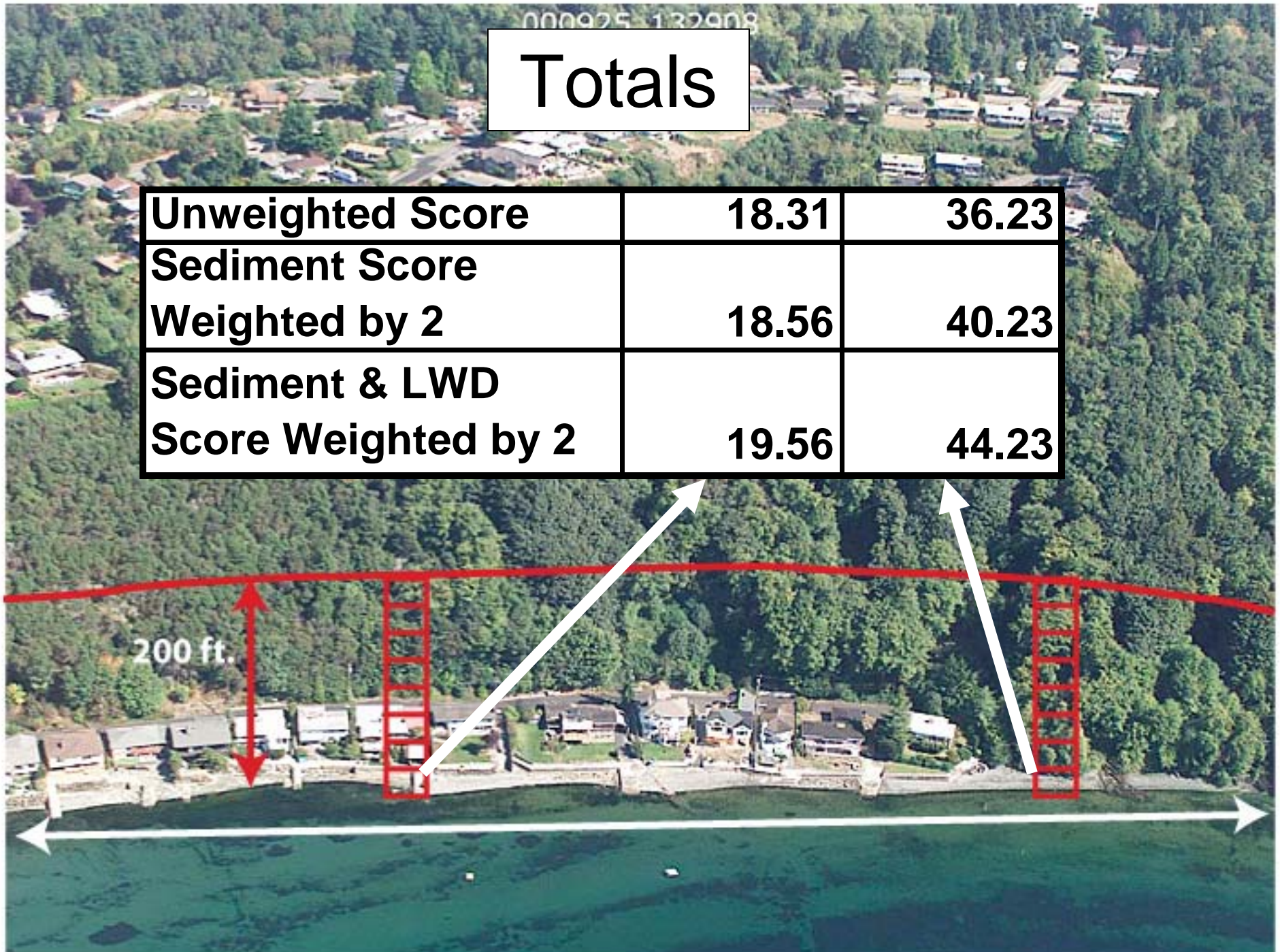
36.23

200 ft.



Totals

Unweighted Score	18.31	36.23
Sediment Score Weighted by 2	18.56	40.23
Sediment & LWD Score Weighted by 2	19.56	44.23



Example of the model output-LWD

Final score



Delivery Score



Movement Score



Loss Score

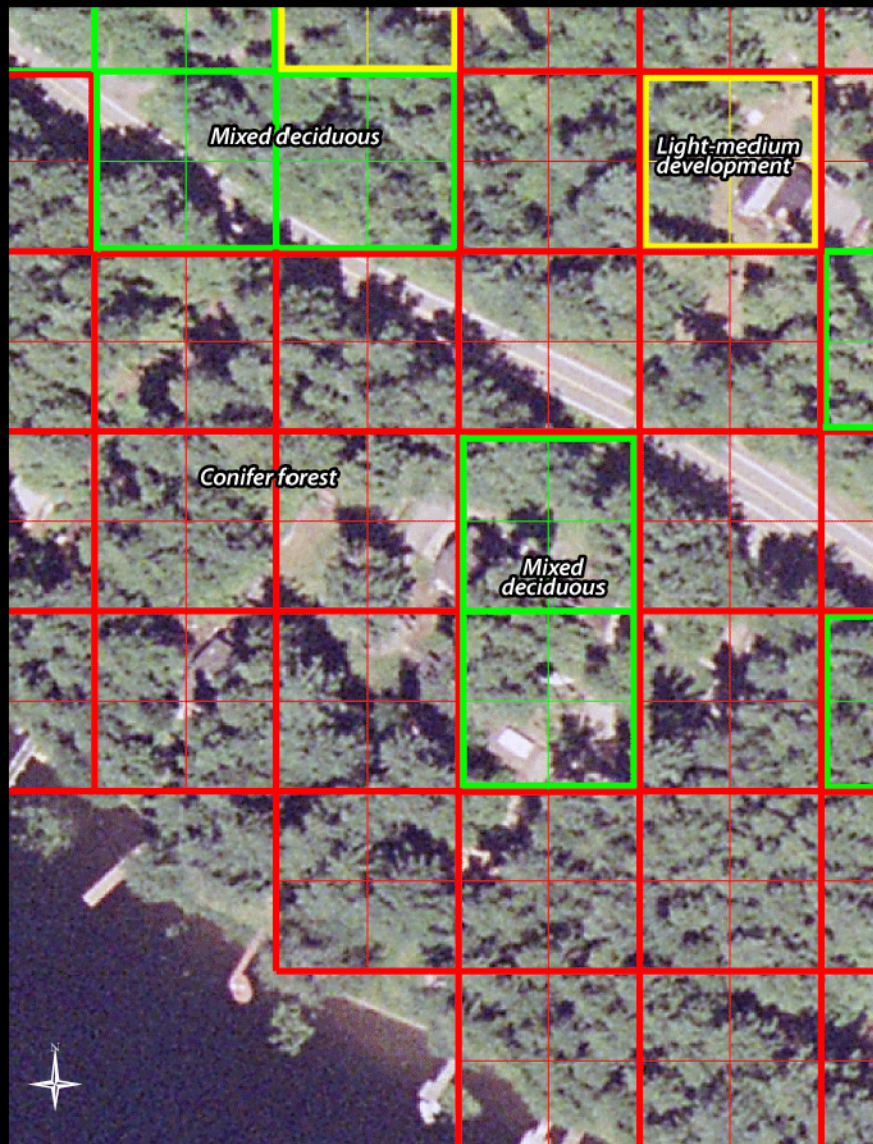


Data sources that are invaluable or you are only as good as your data...

- Land Cover
- Impervious Surface
- Shoreline armoring
- Docks and other overwater structures
- Marine riparian vegetation versus Land Cover
- Agriculture use data
- Sewered and unsewered areas

Limitations of the Model

- Had to simplify scoring - too complex to model on computer
- Lack of lake habitat data - using proxies
- Land Cover data, even the good stuff, is still not as accurate as we would like
- Natural variability is not very well described - it is a bit more of assumed uniformity for scoring purposes



**Example of
U.W. Landcover at Lake Alice**



**Example of U.W. Landcover
with Impervious Surface at Lake Alice**

Next steps for the models?

- Finish running all the models
- Model output will be used in creating environment designations.
- Eventually, plan to use the model to look at cumulative impacts by modifying the data input - not the scoring. Likely done by increasing the level of impervious surface or modifying land cover data.
- Considering the use of the pixel score as part of restoration planning - combined with larger scale basin scores (previous effort)